

The highest and lowest water, mean stage, and monthly range at 127 river stations are given in table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk,

St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Precipitation is expressed in inches and temperature in degrees Fahrenheit.

Alabama.—The mean temperature was 46.0°, or 1.4° above normal; the highest was 75°, at Healing Springs on the 11th, at Eufaula on the 12th, and at Bermuda on the 23d, and the lowest, 19°, at Valleyhead on the 18th and at Decatur on the 31st. The average precipitation was 5.32, or 0.49 above normal; the greatest monthly amount, 11.72, occurred at Lock No. 4, and the least, 2.26, at Livingston.—*F. P. Chaffee.*

Arizona.—The mean temperature was 47.5°, or 3.1° above normal; the highest was 82°, at Sentinel on the 22d and 25th, and the lowest, 6° below zero, at Fort Defiance on the 2d. The average precipitation was 1.29, or 0.53 above normal; the greatest monthly amount, 4.01, occurred at Pinal Ranch, and the least, 0.02, at Walnut Grove.—*W. G. Burns.*

Arkansas.—The mean temperature was 45.6°, or 6.5° above normal; the highest was 78°, at Bee Branch on the 14th and at Rison on the 15th, and the lowest, 7°, at Winslow on the 1st. The average precipitation was 2.21, or 2.20 below normal; the greatest monthly amount, 4.89, occurred at Elon, and the least, 0.76, at Pond.

The mild, open winter has been favorable to wheat, which has made good progress and looks well. The late sown is doing nicely and looks as good as the early sown. Some little damage is being done in a few localities by the hessian fly.—*E. B. Richards.*

California.—The mean temperature was 43.9°, or about normal; the highest was 85°, at Anaheim on the 19th, and the lowest, 26° below zero, at Bodie on the 1st and at Boca on the 10th. The average precipitation was 5.21, or 0.74 above normal; the greatest monthly amount, 24.46, occurred at Summerdale, while none fell at Needles.—*A. G. McAdie.*

Colorado.—The mean temperature was 26.7°, or 2.8° above normal; the highest was 83°, at Blaine on the 13th, and the lowest, 45° below zero, at Antelope Springs on the 14th. The average precipitation was 0.55, or 0.22 below normal; the greatest monthly amount, 4.12, occurred at Ruby, while none fell at Crook and Holyoke.—*F. H. Brandenburg.*

Florida.—The mean temperature was 57.3°, or slightly below normal; the highest was 91°, at Hypoluxo on the 2d, and the lowest, 22°, at Sumner on the 18th and at Middleburg on the 19th. The average precipitation was 2.45, or 0.27 below normal; the greatest monthly amount, 9.62, occurred at Hypoluxo, and the least, 0.25, at Marco.—*A. J. Mitchell.*

Georgia.—The mean temperature was 46.3°, or 0.8° above normal; the highest was 81°, at Quitman on the 11th, and the lowest, 13°, at Dahlonega on the 18th. The average precipitation was 4.80, or 0.30 above normal; the greatest monthly amount, 8.02, occurred at Gainesville, and the least, 2.52, at Brent.

The weather was very favorable to agricultural pursuits and interests. Wheat, oats, and rye are generally reported to be in excellent condition. Moisture has been ample to all needs, and much preparatory work on land has been accomplished.—*J. B. Marbury.*

Idaho.—The mean temperature was 26.4°, or 1.1° above normal; the highest was 75°, at Idaho City on the 3d, and the lowest, 23° below zero, at Lost River on the 1st. The average precipitation was 1.82, or 0.13 below normal; the greatest monthly amount, 4.65, occurred at Murray, and the least, 0.30, at Blackfoot.

During the first twelve days considerable snow fell in the wheat growing districts. Over the high plateaus the snow fell to sufficient depths to afford protection to the cereal crops, but in the low valleys it quickly disappeared, exposing the wheat to the freezing and thawing processes. The grass on the ranges has afforded good grazing, and the necessity has not yet arisen to feed much hay to the stock.—*S. M. Blandford.*

Illinois.—The mean temperature was 30.2°, or 3.5° above normal; the highest was 69°, at St. John on the 16th, and the lowest, 15° below zero, at Kishwaukee on the 1st. The average precipitation was 1.45, or 0.91 below normal; the greatest monthly amount, 2.50, occurred at Rushville, and the least, 0.57, at Martinsville.

The average condition of wheat is favorable, and some improve-

ment over last month is apparent. There has been but little snow protection, especially in the central and southern districts, but, notwithstanding this fact, there has been very little damage by freezing and thawing. Rye is generally in good condition and meadows are looking well.—*M. E. Blystone.*

Indiana.—The mean temperature was 30.4°, or 1.8° above normal; the highest was 68°, at Boonville on the 8th, and the lowest, 15° below zero, at Cambridge and Richmond on the 31st. The average precipitation was 1.44, or 1.46 below normal; the greatest monthly amount, 3.19, occurred at Angola, and the least, 0.45, at Boonville.

At the end of the month wheat is in fair condition; the fly has injured the early sown fields.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 23.7°, or 6.5° above normal; the highest was 60°, at Keokuk on the 15th, and the lowest, 21° below zero, at Elkader on the 1st. The average precipitation was 0.74, or 0.43 below normal; the greatest monthly amount, 2.34, occurred at Olin, and the least, 0.04, at Murray.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 32.5°, or 3.5° above normal; the highest was 80°, at Ulysses on the 16th, and the lowest, 21° below zero, at Achilles on the 1st. The average precipitation was 0.41, or 0.45 below normal; the greatest monthly amount, 1.70, occurred at Oswego, and the least, 0.02, at Newton.

Wheat continued in good condition in the eastern, middle, and southern counties; the cold weather the last of December and the first days of January checked its rapid growth, and the dry weather prevented a renewal; it has afforded good pastures in many counties. The fly has injured it in a few of the central counties. In the northwestern and western counties much of the early sown has died, while the later sown remains in the ground dormant. Much spring plowing has been accomplished in the south.—*T. B. Jennings.*

Kentucky.—The mean temperature was 36.7°, or 1.3° above normal; the highest was 75°, at Franklin on the 8th and 9th, and at Manchester on the 9th, and the lowest, 4°, at Scott on the 31st. The average precipitation was 1.85, or 2.31 below normal; the greatest monthly amount, 4.06, occurred at Franklin, and the least, 0.47, at Frankfort.

It is thought that wheat was injured to some extent by freezing, owing to almost entire absence of snow protection, but as there were no severe or extended cold spells it is probable that the damage from freezing is not general nor very great. The crop is in bad condition in some localities from attacks of the hessian fly. Mild and comparatively dry weather permitted considerable plowing for corn.—*H. B. Hersey.*

Louisiana.—The mean temperature was 53.0°, or 2.3° above normal; the highest was 80°, at Donaldsonville on the 9th, and the lowest, 20°, at Plain Dealing on the 19th. The average precipitation was 3.75, or 1.28 below normal; the greatest monthly amount, 6.51, occurred at Como, and the least, 0.72, at Minden.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 32.6°, or 0.7° above normal; the highest was 68°, at Charlotte Hall, Md., on the 9th, at Takoma Park, Md., on the 15th, and at Milford, Del., on the 17th; the lowest, 4° below zero, at Deepark, Md., on the 20th. The average precipitation was 2.72, or 0.13 below normal; the greatest monthly amount, 6.22, occurred at Deepark, Md., and the least, 1.14, at Cumberland, Md.—*Oliver L. Fussig.*

Michigan.—The mean temperature was 21.4°, or about normal; the highest was 55°, at Traverse City on the 20th, and the lowest, 28° below zero, at Humboldt on the 3d. The average precipitation was 1.77, or 0.52 below normal; the greatest monthly amount, 5.40, occurred at Berrien Springs, and the least, 0.65, at Port Austin.—*C. F. Schneider.*

Minnesota.—The mean temperature was 13.2°, or 2.8° above normal; the highest was 49°, at Blooming Prairie on the 14th, and the lowest, 47° below zero, at Pokegama on the 2d. The average precipitation was 0.33, or 0.38 below normal; the greatest monthly amount, 1.00, occurred at Red Wing, and the least, trace, at Leech Lake Dam.

The snow in the timber regions seems to have been more abundant. With moderately cold weather which favored the making of ice roads in the woods the lumbermen have been able to haul their logs satisfactorily.—*T. S. Outram.*

Mississippi.—The mean temperature was 48.8°, or 2.0° above normal; the highest was 76°, at Biloxi on the 29th, and the lowest, 18°, at Ripley on the 31st. The average precipitation was 5.23, or about normal; the

greatest monthly amount, 9.05, occurred at Thornton, and the least, 2.49, at Biloxi.—*W. S. Belden.*

Missouri.—The mean temperature was 34.9°, or 5.1° above normal; the highest was 72°, at several stations on the 15th, and the lowest, 11° below zero, at Bethany on the 1st. The average precipitation was 1.30, or 0.84 below normal; the greatest monthly amount, 3.57, occurred at Fulton, and the least, 0.22, at Gallatin.

For the State, as a whole, it was the warmest January during the past fourteen years. In the southern portion of the State much plowing was done for spring crops. Although wheat received little or no protection from snow, the ground being comparatively dry very little damage resulted from alternate freezing and thawing, and at the close of the month the crop was reported in excellent condition, except in those counties in the eastern and southern sections, where the early sown has been seriously injured by fly. Pastures continue to afford considerable grazing and stock required much less feed than usual.—*A. E. Hackett.*

Nebraska.—The mean temperature was 26.7°, or 6.2° above normal; the highest was 72°, at Palmer on the 21st, and the lowest, 27° below zero, at Madrid on the 2d. The average precipitation was 0.17, or 0.44 below normal; the greatest monthly amount, 1.30, occurred at Beatrice, while none fell at several western stations.

Snow remained on the ground but a short time, and the ground was uncovered most of the month. The temperature was so high, however, that no damage resulted to fall sown grain. The month was most favorable for all agricultural interests.—*G. A. Loveland.*

Nevada.—The mean temperature was 30.1°, or 4.3° above normal; the highest was 75°, at Lovelock on the 24th, and the lowest, 19° below zero, at Hamilton on the 2d. The average precipitation was 1.51, or 0.44 below normal; the greatest monthly amount, 6.33, occurred at Lewers Ranch, and the least, trace, at Hot Springs.—*J. H. Smith.*

New England.—The mean temperature was 21.8°, or about normal; the highest was 55°, at New Bedford, Mass., on the 10th, and the lowest, 31° below zero, at St. Johnsbury, Vt., on the 20th. The average precipitation was 2.24, or 1.64 below normal; the greatest monthly amount, 6.67, occurred at Carmel, Me., and the least, 1.21, at Bristol, R. I.

The temperature conditions of the month were exceptionally favorable to the ice interests, and large crops have been harvested in excellent condition.—*J. W. Smith.*

New Jersey.—The mean temperature was 30.4°, or slightly above normal; the highest was 63°, at Beverly and Friesburg on the 16th, and the lowest, 6° below zero, at Layton on the 20th. The average precipitation was 2.52, or 1.14 below normal; the greatest monthly amount, 4.00, occurred at Ocean City, and the least, 1.35, at Layton.—*E. W. McGann.*

New Mexico.—The mean temperature was 35.5°, or 2.4° above normal; the highest was 78°, at Gallinas Springs on the 23d, and the lowest, 20° below zero, at Bluewater on the 2d. The average precipitation was 0.51, or about normal; the greatest monthly amount, 2.00, occurred at Winsors, and the least, trace, at Bluewater and Socorro.—*R. M. Hardinge.*

New York.—The mean temperature was 23.0°, or slightly above normal; the highest was 54°, at Lockport on the 25th, and the lowest, 37° below zero, at Axton on the 20th. The average precipitation was 2.10, or 0.79 below normal; the greatest monthly amount, 4.15, occurred at South Berlin, and the least, 0.76, at Binghamton.

Snow protection obtained in the northern portion during the entire month, being very heavy in and around the mountain sections and in a large part of the central sections. Very little snow fell during the month in the southern counties of the interior and in the southeast section, including the Hudson Valley south of Albany, until the last two days, when moderate snows were general in nearly all sections. Some damage to wheat and rye in unprotected sections is reported, but the month on the whole was favorable, and the condition of these crops was about the average on January 31.—*R. G. Allen.*

North Carolina.—The mean temperature was 40.8°, or slightly above normal; the highest was 81°, at Washington on the 11th, and the lowest, 6°, at Highlands on the 18th. The average precipitation was 2.93, or 1.40 below normal; the greatest monthly amount, 7.50, occurred at Murphy, and the least, 1.76, at Pittsboro.

The weather was generally favorable for wheat. Some reports were received of damage by freezing and high winds, but plants generally were too well rooted to suffer much. Wheat spread nicely and looked vigorous and promising at the close of the month.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 7.7°, or about 1.0° above normal; the highest was 68°, at Fort Yates on the 23d, and the lowest, 39° below zero, at Pembina on the 2d. The average precipitation was 0.28, or 0.15 below normal; the greatest monthly amount, 1.64, occurred at Dunseith, and the least, trace, at Falconer and Steele.

Some suffering was experienced by stock grazing on the prairies during storms, but no serious loss is reported. On the whole the month was very favorable for stock raisers.—*B. H. Bronson.*

Ohio.—The mean temperature was 29.2°, or 1.4° above normal; the highest was 67°, at Hanging Rock on the 9th, and the lowest, 10° below zero, at Wauseon on the 3d. The average precipitation was 1.70, or 1.24 below normal; the greatest monthly amount, 3.30, occurred at Montpelier, and the least, 0.67, at Philo.

Wheat has been injured some in the southern part of the State by freezing and thawing, but in the middle and north no material injury has resulted and many correspondents in these sections report the plants in excellent condition. Other winter grains are reported in good condition. Fruit trees have received no injury during the winter.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 40.8°, or 2.7° above normal; the highest was 79°, at Hartshorne on the 15th, and the lowest, 11° below zero, at Kenton on the 1st. The average precipitation was 0.52, or 0.84 below normal; the greatest monthly amount, 1.90, occurred at Bengal, while none fell at Roff.

The weather conditions during the month were but a continuation of those existing during December, that is, characterized by warm weather and deficient rainfall. Wheat was in very good condition, growing rapidly, and being extensively pastured. Stock was doing well and feed was plentiful. Plowing for spring crops was under rapid headway, except where ground was too dry to work.—*C. M. Strong.*

Oregon.—The mean temperature was 36.7°, or nearly normal; the highest was 76°, at Prineville on the 1st, and the lowest, 8° below zero, at Burns on the 8th and at Beulah on the 9th. The average precipitation was 7.63, or 1.47 above normal; the greatest monthly amount, 19.39, occurred at Hare, and the least, 0.08, at Silverlake.

The month as a whole was unfavorable for farm work, owing to unusually heavy precipitation during the first half of the month, which rendered the soil too wet for plowing. The closing days were more favorable, being moderately warm for the season, with an abundance of bright sunshine and drying easterly winds. Winter wheat made satisfactory advancement, and at the close of the month was everywhere reported in excellent condition. The hessian fly has entirely disappeared since the heavy rains. Pastures were greatly benefited by the wet weather, and there is an abundance of feed for stock.—*A. B. Wollaber.*

Pennsylvania.—The mean temperature was 29.1°, or 1.4° above normal; the highest was 59°, at Pittsburg on the 10th, at Philadelphia on the 16th, and at Lancaster on the 17th, and the lowest, 10° below zero, at Saegertown on the 6th and at Lawrenceville on the 31st. The average precipitation was 2.22, or 1.04 below normal; the greatest monthly amount, 4.41, occurred at Somerset, and the least, 0.74, at Athens.

Owing to the light snowfall and the successive freezing and thawing weather during the first three weeks in the month, wheat and rye were both damaged somewhat by the roots being heaved out of the ground, but the average condition of these crops at the close of the month was considered better than at the close of January, 1900.—*L. M. Dey.*

South Carolina.—The mean temperature was 45.1°, or slightly above normal; the highest was 81°, at Trial on the 10th, and the lowest, 18°, at Liberty on the 20th. The average precipitation was 3.55, or slightly below normal; the greatest monthly amount, 5.60, occurred at Liberty, and the least, 1.20, at Pinopolis.

The ground was generally too wet to plow and little or no spring oats were sown. Wheat and oats were in good condition at the close of the month.—*J. W. Bauer.*

South Dakota.—The mean temperature was 21.0°, or about 6.0° above normal; the highest was 63°, at Academy on the 19th, and the lowest, 23° below zero, at Leola on the 2d. The average precipitation was 0.12, or 0.43 below normal; the greatest monthly amount, 0.47, occurred at Fort Meade, while none fell at Oelrichs.—*S. W. Glenn.*

Tennessee.—The mean temperature was 40.1°, or 1.7° above normal; the highest was 70°, at Johnsonville on the 8th and at Grace and McMinnville on the 9th, and the lowest, 11°, at Iron City on the 18th and at Hohenwald on the 31st. The average precipitation was 3.94, or 0.90 below normal; the greatest monthly amount, 6.58, occurred at Tellico Plains, and the least, 1.88, at Elk Valley.

The weather was generally favorable for wheat, but growth was slow, the absence of snow and the alternate freezing and thawing keeping it backward.—*H. C. Bate.*

Texas.—The mean temperature was 52.4°, or 3.8° above normal; the highest was 87°, at Camp Eagle Pass on the 29th, and the lowest, 3°, at Tulia on the 2d. The average precipitation was 0.60, or 1.70 below normal; the greatest monthly amount, 3.30, occurred at Longview, while none fell at several stations.

The month as a whole was unfavorable for agricultural interests, except in a few instances. The rainfall over the central and northern portions of the State was especially light and was insufficient for growing crops, and also for keeping the soil in condition for tillage. Wheat suffered for rain in many localities, and while growing nicely in a few places, all reports at the close of the month indicated that the crop needed rain badly. Preparations for spring crops are being pushed as rapidly as possible. Dry weather is interfering with plowing in many localities, and a general rain is needed at the close of the month.—*I. M. Cline.*

Utah.—The mean temperature was 28.2°, or 2.7° above normal; the highest was 64°, at St. George on the 6th, and the lowest, 26° below zero, at Henefer on the 1st. The average precipitation was 0.68, or 0.30 below normal; the greatest monthly amount, 2.24, occurred at Park City, while none fell at Smithville.—*L. H. Murdoch.*

Virginia.—The mean temperature was 35.5°, or 1.9° above normal;

the highest was 77°, at Bonair on the 9th, and the lowest, zero, at Hot Springs on the 31st. The average precipitation was 2.61, or 0.53 below normal; the greatest monthly amount, 4.33, occurred at Bigstone Gap, and the least, 1.62, at Stanardsville.

Winter crops made quite favorable progress throughout the month. Thus far no evidences of winter killing have developed. There is very little complaint of damage from hessian fly. The early seeding is generally in fine condition of growth and vigor, while the late seeding is somewhat backward. Considerable spring plowing was done during the latter part of the month in portions of the valley sections.—*E. A. Evans.*

Washington.—The mean temperature was 33.1°, or slightly above normal; the highest was 59°, at Walla Walla on the 12th, and the lowest, 17° below zero, at Republic on the 9th. The average precipitation was 4.56, or 0.37 below normal; the greatest monthly amount, 13.78, occurred at Neah Bay, and the least, 0.84, at Pasco.

Considerable snow fell during the forepart of the month, which melted during the latter part.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 33.6°, or 1.2° above normal; the highest was 69°, at Green Sulphur Springs on the 9th, and the lowest, 4° below zero, at Dayton on the 20th. The average precipitation was 2.41, or 0.52 below normal; the greatest monthly amount, 3.87, occurred at Beverly, and the least, 1.18, at Parkersburg.

The weather has been dry and rather mild during the month, but the almost daily freezing and thawing, with practically no snow protection, has been unfavorable for wheat, rye, and grass.—*E. C. Voss.*

Wisconsin.—The mean temperature was 17.8°, or 3.1° above normal; the highest was 59°, at Port Washington on the 19th, and the lowest, 31° below zero, at Grantsburg and Hayward on the 2d. The average precipitation was 0.77, or 0.69 below normal; the greatest monthly amount, 1.70, occurred at Port Washington, and the least, 0.10, at Bayfield.—*W. M. Wilson.*

Wyoming.—The mean temperature was 24.7°, or 2.4° above normal; the highest was 65°, at Cody on the 18th, and the lowest, 44° below zero, at Daniel on the 1st. The average precipitation was 0.26, or 0.39 below normal; the greatest monthly amount, 2.28, occurred at Fort Yellowstone, while none fell at several stations.—*W. S. Palmer.*

Cuba.—The mean temperature was 70.5°; the highest was 91°, at San Cayetano on the 2d, Los Canos (Guantanamo) on the 3d and 16th, and Soledad (Guantanamo) on the 2d and 4th, and the lowest, 38°, at Rosario (Aguacate) on the 27th. The average precipitation was 1.52; the greatest monthly amount, 8.44, occurred at Havana, and the least, 0.22, at Puerto Principe.

The weather was ideal for harvesting and grinding the cane crop, but lack of rain and the prevalence of brisk winds proved injurious to the tobacco.—*M. W. Hayes.*

Porto Rico.—The mean temperature was 74.1°, or 0.7° above normal; the highest was 96°, at Cayey on the 19th, and the lowest, 50°, at Comerio on the 12th. The average precipitation was 5.09, or 0.46 below normal; the greatest monthly amount, 14.20, occurred at Coamo, and the least, 2.19, at Mayaguez.

Sugar making is general and the weather very favorable. Cane is maturing nicely; yield of the crop is an average, but not as good as anticipated. The new crop of cane is doing well and some still being planted. The new crop of tobacco is doing well; the old crop is being cut; yield is below an average, but the quality is good. Coffee trees are blooming well and a good crop is promised. Small crops, such as beans, lettuce, corn, cucumbers, cabbage, carrots, sweet potatoes, squashes, lernes, okra, and cazava, are being gathered. Some new crops are being planted. Rain is needed over the extreme western districts, where the drought continues.—*Joseph L. Cline.*

SPECIAL CONTRIBUTIONS.

THE RELATION OF RAINFALL TO MOUNTAINS.

By W. H. ALEXANDER, Observer Weather Bureau, dated January 18, 1901.

The object of the present communication is to enable the reader to arrive at a clear understanding as to how and to what extent hills and mountains influence the rainfall of a country. To this end attention is invited to a brief summary of well established facts and principles relative to temperature, evaporation, and condensation.

The water contained in any vessel, although it appears to be one mass, is in reality made up of a vast number of minute masses called molecules of water, separate and distinct from each other. Although no one has ever seen these molecules, yet no student of science can doubt their existence any more than he doubts the existence of individual grains of sand in a block of sandstone. It is confidently believed that if a person were endowed with supernatural sight, he could see these countless molecules. Most likely he would be greatly astonished at the large distances separating them and at the rapid and ceaseless motion of these minute bodies among themselves. This inter-molecular motion gives us the phenomenon of heat and the violence of the motion determines the temperature of the body; if they move slowly, the temperature is low; if rapidly, the temperature is high. The amount of heat within a body must depend, not only on the rate of molecular motion, but on the number of the molecules and their size or mass; the amount of heat in a body is the sum total of all the molecular energy within the body. The temperature does not mean the amount of heat, because the body may have a high temperature and very little heat, or a low temperature and a large amount of heat. That heat which a body contains that does not raise its temperature is called latent heat. The amount of heat that it is necessary to give a body in order to raise the temperature of a unit mass by one degree is called the specific heat.

Suppose that in some way the temperature is lowered and molecular motion overcome until finally the molecules cease their struggle and come to rest; the body is now without heat, its temperature is said to be that of absolute zero and

the body has contracted in volume to its smallest possible size. Gases, like the air, contract so regularly that by measuring their volumes at temperatures successively lower and lower, it has been calculated that they would have no volume, or one inappreciably minute, at a temperature of about -460° on the Fahrenheit scale, or -273° on the centigrade scale, which, therefore, corresponds with the absolute zero of temperature. If we should put the zero of our thermometer at this point on the scale and count from that point upward, we should have what are called absolute temperatures; thus, the temperature of freezing water is 273° C.; on the absolute scale, or 460° F. A glass of water that has a temperature of 70° on the ordinary Fahrenheit scale, would have one of 530° on the absolute Fahrenheit scale.

Again, as heat is the energy of the rapidly moving molecules, the superhuman observer would see them striking against the sides of the vessel containing the liquid and pounding each other incessantly, thereby producing a pressure against the sides of the vessel; but at the upper surface, the so-called free surface of the liquid, there would seem to be a battle between the molecules of water below and those of the air above. The gaseous molecules are pounding down upon the water, the aqueous molecules are striking upward from below. There is a boundary surface between the two at which a majority of the molecules seem to rebound back into their own element, but occasionally a molecule of water shoots far into the region of air and more rarely one of air shoots into the water. These become, as it were, lawless wanderers in the enemy's country; they are captives that will probably never return to the mass from which they are separated. This breaking away of the molecules of water escaping into the space above is called evaporation. This free molecule is now called water vapor, although no change has occurred in its real nature. The rate at which evaporation takes place depends upon the extent of the evaporating surface as well as on the pressure exerted by the exterior gas upon that surface and on the temperature, not only of the evaporating liquid, but of the gas into which the evaporation takes place. The rela-